

Alstom  
analysis - Extr Placement

**INTERMOUNTAIN POWER SERVICE CORPORATION  
RESPONSE TO TELECON QUESTIONS OF 3 JANUARY 2001**

**Q.1 Please provide information indicating the effect on cycle parameters of moving the HP steam path extraction to the final feedwater heater one stage upstream (from after Stage 5 to after Stage 4).**

**Response**

Please find attached two diagrams indicating the effect of moving the extraction from after HP Stage 5 (Figure 12A) to after HP Stage 4 (Figure 12B). Note that Figure 12A is based on Figure 12 from Section 5 of the ALSTOM Power proposal with additional data added.

The two diagrams allow comparison of extraction steam pressure, temperature, enthalpy, mass flow and volumetric flow together with comparisons of final feedwater temperatures, HP exhaust pressure and temperature, HP shaft power and unit output and heat rate for the two steam extractions.

It will be noted the steam mass flow extracted to the top heater at higher pressure increases by just over 25% whilst the specific volume reduces by only 9%. The net effect is to increase the volumetric flow rate to the top heater by approximately 15%. IPSC is advised to consult the original supplier of the HP feedwater heater to assess whether it can be operated safely with increased steam pressure and increased steam velocity.

It will also be noted that the overall reduction in unit output is only 16.5 MW (not the 23 MW stated in the phone call). This value is based on using the same heater TTDs in both cases and now takes into account the variation in bled steam pipe pressure drops with increased extraction steam flow.

ALSTOM Power confirms that the change in steam extraction position can be accommodated mechanically in the steam turbine design. If desired, it would also be possible to redesign the HP turbine retrofit offered to provide an intermediate steam extraction pressure (e.g. to minimize the increase in extraction steam pressure/velocity).

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**The data provided on Figures 12A and 12B are for information only. ALSTOM Power would be prepared to formulate new performance guarantees corresponding to the revised extraction arrangement or to a different agreed arrangement.**